

REMARKS

Claims 1-4, 6-15, 17 and 21-27 are now pending in the application. Claims 1 and 17 have been amended and claim 16 has been canceled. Claims 25-27 have been added as new. Support for the foregoing amendments can be found throughout the specification, drawings, and claims as originally filed. The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 102

Claims 1, 3-4, 6-7, 10, 14, 16-17, and 23 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Koumura et al. (U.S. Pat. No. 4,463,361). This rejection is respectfully traversed.

Claim 1 recites “a printhead arrangement including a plurality of ink jet printheads for emitting droplets towards a surface of the substrate to form the image, wherein the printhead arrangement extends across substantially the full width of the substrate in a direction perpendicular to the printing direction.” Accordingly, an image can be printed by the printer during a single pass of the substrate past the printheads. Claim 1 further recites “the apparatus is adapted to hold the printheads substantially stationary while the image is printed in a pass of the substrate past the printhead arrangement.” Such an arrangement is described at least at page 10 line 26 to page 11 line 19 in relation to Figure 1.

Claim 1 is directed to improvements relating to printing systems in which a substrate is moved past printheads during the printing operation. In accordance with

the invention defined in claim 1, the printhead arrangement extends the full width of the image and the printheads are held stationary during printing. While the droplets are emitted from the printheads, the substrate is moved on the rollers.

Such an arrangement can achieve printing of a substrate in a single pass of the substrate past the printhead arrangement. Such arrangements where a substrate can be continuously moved through the printer can give a high throughput and efficient printing. However, the accuracy of movement of the substrate in such systems is important to achieve proper registration of the droplets deposited on the substrate. Embodiments of claim 1 can provide apparatus including a roller arrangement which can provide highly accurate movement of the substrate during printing.

None of the references cited by the Examiner teach or suggest the above mentioned features of claim 1.

Koumura et al (US4463361) cited by the Examiner in paragraph 4 of the action at best appears to show a printer in which printheads 22, 23 reciprocate from side to side across the width of the substrate during printing. After the printhead has carried out a side-to-side scan, the substrate is advanced before a further scan of the printheads is carried out. As can clearly be seen in for example Figure 1 of Koumura, the width of the printheads in the direction perpendicular to the direction of advance of the substrate is very small compared with the width of the substrate.

There is no disclosure or suggestion in Koumura of an arrangement as defined in claim 1 in which printheads extend across the full width of the substrate. By having the printheads so extending, it is possible for the full width of the image to be printed on the substrate in a single pass of the substrate past the printheads, without movement of the

printheads being required. There is no suggestion of such an arrangement in Koumura. In Koumura, the printheads cannot print a substrate in a single pass because the printheads do not extend across the required width of the substrate.

Thus, the printing system described in Koumura differs substantially from claim 1, in which the printheads extend across the width of the substrate and the substrate is moved during printing while the printheads are substantially stationary. Applicant submits that, contrary to the assertion of the Examiner, there is nothing in Koumura which would indicate to the skilled person that the printing apparatus described could be operated so that the printheads 22, 23 were stationary during the emission of the ink; to operate the printer in that way would not be contemplated because it would not be efficient, in particular as in the case of the example shown (for example in Figure 2) in which the width of the printheads is considerably less than that of the substrate.

The skilled person seeking to improve a printing system in which a substrate is moved past printheads during the printing operation would not consider Koumura which relates to a different type of printing system. Furthermore, there is nothing in Koumura which would lead the skilled person looking to provide an improved substrate transport system to change entirely the printing system of Koumura, to a system in which the printheads extend across the width of the substrate.

Therefore, Applicant submits that claim 1 and its dependent claims 1-4, 6-15, and 21-25 define over Koumura.

Claim 17 recites “the printheads extend[ing] at least the full width of the image to be printed in a direction perpendicular to the printing direction” and “emitting droplets from the printheads towards the substrate during the movement of the substrate past

the printhead arrangement such that the image is printed onto the substrate in one pass of the substrate past the printhead arrangement.” As discussed above, there is no teaching or suggestion in Koumura of a method in which an image is printed in a single pass of the printheads across the substrate. As discussed above, in the printer of Koumura, the image is built up by multiple reciprocating scans of the printheads 22, 23 across the width of the substrate. There is nothing in Koumura to suggest to the skilled person to change entirely the printing system to one in which the printheads extend across the image to be printed in a direction perpendicular to the printing direction. Furthermore, as discussed previously, there is nothing in Koumura to suggest that the printheads would be held stationary during the emission of droplets from the printheads. Indeed as indicated above, Applicant submits that the skilled person would not contemplate operating the printing system of Koumura in such a way.

Contrary to the assertion by the Examiner in paragraph 4j, there is nothing in Koumura to disclose or suggest that the printheads are substantially stationary during emission of droplets towards the substrate.

The Examiner has also referred to US 6416176 Yasui et al. Applicant notes that Yasui also at best relates to a printer in which a printhead (14) is moved perpendicular to the direction of travel of the substrate (copy sheet 3) during printing: see for example column 4 lines 1 to 9 in relation to Figure 1. There is also no teaching or suggestion of a printer as defined in claim 1, nor of a method as defined in claim 17 of the present application in which a printhead arrangement extends across the width of the substrate perpendicular to the direction of movement of the substrate in the printer. Furthermore, there is no suggestion in Yasui of a printer in which the printheads are stationary during

emission of droplets from the printheads and during movement of the substrate through the printer.

There is no disclosure or suggestion in any of the references cited by the Examiner of the arrangement of claim 1 or method of claim 17. Therefore, Applicant submits that claim 1 and its dependent claims 2-4, 6-15, and 21-25 as well as claim 17 define over the art cited by the Examiner.

REJECTION UNDER 35 U.S.C. § 103

Claims 2, 11 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koumura et al. (U.S. Pat. No. 4,463,361).

Claims 8-9 and 21-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koumura et al. (U.S. Pat. No. 4,463,361) in view of Yasui et al. (U.S. Pat. No. 6,416,176).

Claims 13 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Koumura et al. (U.S. Pat. No. 4,463,361) in view of Martin et al. (U.S. Pat. No. 5,255,020).

Claim 24 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Koumura et al. (U.S. Pat. No. 4,463,361) in view of Greive (U.S. Pat. No. 6,834,949).

These rejections are respectfully traversed.

Claims 2, 8-9, 11-13, 15, 21-22, and 24 depend from claim 1 and, thus, define over the art cited by the Examiner at least for reasons presented above regarding claim 1.

NEW CLAIMS

Claims 25-27 are new. Claim 25 depends from claim 1 and, thus, defines over the art cited by the Examiner at least for reasons presented above regarding claim 1.

New independent claims 26 and 27 additionally require the feature that the path of the substrate through the printer is substantially planar. In this way, deflection of the substrate in the printer can be avoided or reduced, and thus it becomes possible to print substantially rigid substrates.

There is no disclosure or suggestion of such an arrangement in Koumura. As can be seen from for example Figure 1, the substrate follows a turning, non-planar path through the printer, beginning in the cassette 1, turning through 90 degrees between rollers 6A and 68, turning again through 90 degrees from rollers 9A and 98 to rollers 10A to 108. There is further no teaching or suggestion in Koumura of the printheads being stationary during the deposition of the droplets as discussed above in relation to claim 1.

Similarly, Yasui requires the substrate 3 to bend over the curved surface of the roller 24. It will also been seen that further deflection of the substrate is required for it to pass from the roller 24 to the sheet guide member. Furthermore, deflection of the substrate through almost 180 degrees is required to move the substrate from the cassette (4) to the sheet guide member (27) at the printhead (14) (see Figure 1).

Indeed, none of the references cited provide an apparatus for printing onto a rigid substrate. None of the references teach or suggest a printer in which the substrate can pass through substantially in a planar path, as required by claims 26 and 27.

Applicant submits that the skilled person looking to improve the transport of rigid substrates in a printer would not look to Koumura or to Yasui because the printing

apparatus described is not suitable for printing onto rigid substrates. Even if the skilled person had considered those references, he would not have arrived at the claims, because he would not have considered changing entirely the printing system of Koumura and Yasui from a system in which the printheads move during the deposition of ink (in Koumura and Yasui) to a system in which the printheads are stationary during printing as defined in the present claims.

Therefore, Applicant submits that claims 26 and 27 define over the art cited by the Examiner.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action and the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner

believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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